

Collected Physical Papers/On Double Refraction of the Electric Ray by a Strained Dielectric

< Collected Physical Papers

III

ON DOUBLE REFRACTION OF THE ELECTRIC RAY BY A STRAINED DIELECTRIC

The following investigations were undertaken to find whether a solid dielectric becomes double-refracting to the electric ray when it is subjected to a molecular stress by unequal expansion in two directions, or by mechanical compression.

The Electric Polarisation Apparatus, previously described, was used for these experiments. The Analyser and the Polariser were crossed. The strained substance was then introduced between the crossed Analyser and Polariser.

Effect due to unequal expansion

I cast a rectangular piece of paraffin, and chilled its surface unequally by a freezing mixture. On suitably interposing this between the Polariser and the Analyser, the galvanometer spot was at once deflected, proving the double-retracting nature of the strained dielectric. The piece was cast six months ago. It retains its unannealed property even now.

I took two zinc tubes, one cylindrical and the other rectangular, and made castings of melted pitch, which set on cooling. In the cylindrical tube the strain was the same in all directions at right angles to the axis, and this cylindrical mass of pitch did not exhibit any double-refraction. But in the tube with the square section, unequal strain was evident in rectangular directions, perpendicular to the axis; two of the opposite sides bulged out, and the other two bulged in. On interposing this piece between the crossed Polariser and Analyser, it exhibited double-refraction.

Effect due to compression

It appeared that stratified rocks, which, from the nature of their formation, were subjected to great pressure, would serve well for the purpose of this experiment. My anticipations were verified, as the following experiments will show:—

I took a cube of Sandstone, about 5 cm. on each side, and held it between the Polariser and the Analyser, *with the plane of stratification inclined at 45°*. The galvanometer at once responded.

I then rotated the piece of rock, and adjusted it with its *plane of stratification parallel to the vibration plane of the Polariser*. There was now no depolarisation effect, the galvanometer remained unaffected. On further rotation in the same direction, the depolarisation effect re-appeared, to disappear again when the plane of stratification was made parallel to the vibration plane of the Analyser.

Experiments with many other rocks, gave similar result.

(The Electrician, Dec. 1895.)

Retrieved from "https://en.wikisource.org/w/index.php?

title=Collected_Physical_Papers/On_Double_Refraction_of_the_Electric_Ray_by_a_Strained_Dielectric&oldid=6643266"

This page was last edited on 2 February 2017, at 17:44.

Text is available under the Creative Commons Attribution-ShareAlike License; additional terms may apply. By using this site, you agree to the Terms of Use and Privacy Policy.